

FHWA/TRB MANAGED AND PRICED LANES WORKSHOP

Summary of Workshop Results

Background:

Potential policy, program and research initiatives to advance the planning and implementation of Managed and Priced Lanes were the focus of the TRB and Federal Highway Administration (FHWA), Office of Operations two-day workshop in Key Biscayne, FL on November 18 and 19, 2003. Enthusiasm and participation at the workshop yielded numerous ideas and initiatives from over 20 experts gathered from across North America.

The workshop was structured to address managed lanes during Day 1 and priced lanes during Day 2, each day beginning with a presentation of the state-of-the-practice and identified gaps in practice. The bulk of both days were spent in small groups that each focused on a broad subject area and developed research problem statements and program initiatives to address gaps in the specific area. Because of the interrelationship between managed lanes (in the broadly defined sense) and priced lanes (a specific type of managed lane), there were obvious replication in outcome between the problem statements developed in Day 1 and Day 2. The summary provided below includes the priority research problem statements. Attachment 1 lists all problem statements, without any attempt to merge overlapping ideas.

Each day concluded with a discussion of how to move the research initiatives forward, which is summarized for each day.

Workshop Day 1 – Managed Lanes

Research Initiatives for Managed Lanes:

Topic Area 1: Selection of Lane Management Strategies:

- *Priority 1:* A traveling workshop or outreach group as a peer-to-peer program envisioned as a non-advocacy group that would present easy-to-understand tools.
- *Priority 2:* A synthesis of all experience to date, identifying both the determinants of success and the pitfalls for failure.

Topic Area 2: System Planning, Regional Programs and Initiatives Planning for Managed Lanes.

- *Priority 1:* Develop tools and techniques for demand analysis, revenue projection, environmental justice/equity assessment, freight analysis, and cost - benefit analysis.
- *Priority 2:* Define a process for considering managed lanes in a freeway corridor.

Topic Area 3: Facility Planning and Design

- *Priority 1:* Preparation of design guidance / manuals with examples of a range of scenarios/conditions.
- *Priority 2:* Development of applied engineering and modeling to support

- managed lane project development and design.
- *Priority 2:* Multimodal integration issues

Topic Area 4: Day-to-Day Management and Operations:

- *Priority 1:* Address automated occupancy enforcement.
- *Priority 2:* Develop managed lanes measures of effectiveness.

Motivating Actions for Managed Lanes:

At the end of the first day, motivating actions that FHWA, individuals, local state or federal agencies, or professional associations might pursue to encourage State Departments of Transportation, Metropolitan Planning Organizations and others to plan for and implement managed lanes were identified. Ideas that were presented included:

- simple and clear primers or publications to educate both the public and public officials;
- peer-to-peer scans;
- outreach to toll road and transit groups;
- expansion of research efforts at national and/or state levels;
- outreach and presentations at annual meetings of national associations;
- publications;
- imposition of FHWA regulation, by including managed lanes as one of the 65 planning factors;
- FHWA funds to metro areas to encourage consideration of Managed Lanes.

Workshop Day 2 – Priced Lanes

Policy and Program Initiatives for Priced Lanes:

Category 1: Policy, Planning, and Implementation Processes, as well as Concepts, Rationale and Innovations and Finance Issues

- *Priority 1:* A Comprehensive Policy Analysis of the Future Role of Pricing, HOV Incentives, and Integrated Transit Initiatives.
- *Priority 2:* Integrated Transportation Planning for the Combination of Pricing, HOV, Transit, Land Use and Supportive Demand Management Strategies.

Category 2 : Achieving Public Acceptance

- *Priority 1:* Develop and Market the Message
- *Priority 2:* Develop a Guide for Integrating Pricing into the Regional Transportation Planning Process. This concept included developing a training course and guidebook for the regional planning level.

Category 3: Technical and Operational Issues, Benefits and Ways to Measure the Impacts of Managed and Priced Lanes

- *Priority 1:* Address Enforcement / or Process Control Strategies for HOT lanes. This would focus on the complex issues of the technology, methods, procedures and such to identify occupancy.

TRB Actions:

The closing session focused on what TRB could do to create higher visibility and credibility for priced managed lane strategies.

- Within the TRB committees there is much opportunity for cross-cutting relationships. TRB has currently restructured the groups so this might be a good time to move ahead and have committees work in more of a cross-cutting way. Traditionally, during the summer TRB meetings the HOV Systems Committee has met at a different time and location than the Pricing Subcommittee. Perhaps more formally assigned liaisons and a formal TRB Committee status might help.
- Efforts to present the results of this workshop to various relevant committees at TRB in January 2004.
- Efforts to pursue the research ideas identified during the 2-day workshop should be pursued through various avenues. Many felt that Managed Lanes would be around for a long time and as such merited committee status.

RESEARCH PROBLEM STATEMENTS

Summary of Contents

Workshop Day 1 – Managed Lanes

Topic Area 1: Selection of Lane Management Strategies

Topic Area 2: System Planning, Regional Programs and Initiatives Planning for Managed Lanes

Topic Area 3: Facility Planning and Design

Topic Area 4: Day-to-Day Management and Operations of Managed Lane Facilities

Workshop Day 2 – Priced Lanes

Category 1: Policy, Planning, and Implementation Processes, as well as Concepts, Rationale and Innovations and Finance Issues

Category 2: Achieving Public Acceptance

Category 3: Technical and Operational Issues, Benefits and Ways to Measure the Impacts of Managed and Priced Lanes

Day 1- Topic Area 1
Selection of Lane Management Strategies

Research Problem 1A:

Managed Lane Traveling Workshop or Outreach Group

Expected Outcome(s)

This effort is envisioned as peer-to-peer program (like the ITS peer-to-peer program) funded perhaps by TRB. This is envisioned as a non-advocacy group which would present easy to understand tools to its audience.

Research Problem 1B:

Synthesis of Managed Lane and Priced Lane Experience to Date

Expected Outcome(s)

An effort is needed to identify both the determinants of success and the mechanisms for failure. This “lessons learned” synthesis is intended to attempt to identify the parameters of success (e.g. perceived equity, public support, access) - identify the boundaries that yield a successful project.

Research Problem 1C:

A Catalog or Inventory of Managed Lane Policy Issues and Related Techniques

Expected Outcome(s)

Currently FHWA does not require an operational threshold to be maintained on a managed lane facility. On some HOV facilities, management of the facility has not been enough to maintain successful operation of the facility. Given political pressures and other issues, how do we apply management tools to the successful operation of managed lanes into the future?

Research Problem 1D:

Data Development Efforts

Expected Outcome (s)

This effort would develop a basic set of data that FHWA would ask project partners to collect from managed lanes projects. This effort would seek to collect as much data as possible from existing projects. The goal would be to obtain more useful data on performance and operation of managed lane projects.

Research Problem 1E:

Addressing Managed Lane Goals

Expected Outcome(s)

This effort would address how to deal with or even consider diametrically opposing goals. This research would address how goals can be compatible while being mutually exclusive. This effort would provide broad guidance for potential new project sponsors regarding dealing with goals such as HOV formation, revenue generation, air quality, people moving, revenue use, travel time savings, and reliability.

Research Problem 1F:

A Catalog of Concerns/Issues Regarding Managed Lanes

Expected Outcome(s)

This effort would identify and address concerns and issues of advocacy and interest groups. On occasion concerns of advocacy groups are simply dismissed; by documenting responses to common concerns with managed lanes, the local level representatives charged with considering managed lanes would be better able to address concerns throughout the planning process.

Day 1 - Topic Area 2

System Planning, Regional Programs and Initiatives Planning for Managed Lanes

Research Problem 2 A:

Development of Tools and Techniques for Demand Analysis, Revenue Projection, Environmental Justice/Equity Assessment, Freight Analysis, and Cost/Benefit Analysis

Expected Outcome(s)

This effort would develop tools and techniques for managed lanes development. Tools and techniques in need of refinement through this research effort include: Demand analysis, pricing analysis, environmental justice analysis, impacts on trucks and commercial vehicles, institutional opportunities and approaches including military and toll authority issues, and benefit cost analysis. Further development of these tools will allow local, regional and state entities to better forecast impacts and needs and to better select managed lane strategies as needed.

Research Problem 2B:

Define a Process for Considering Managed Lanes

Research Tasks:

1. Identify best practices for consideration of managed lanes.
2. Review the process for considering managed lanes:
 - A. Step 1: Look at current road facility - can it operate better? Are there gaps or bottlenecks? Is there a need for added capacity?
 - B. Step 2: Look at the funding needed to obtain new capacity
 - C. Step 3: Consider tolling or pricing to help obtain this new capacity.

Expected Outcome(s)

This careful review of how to consider managed lanes in the planning process would provide guidance to encourage and assist potential implementers of managed lanes.

Research Problem 2C:

Taking the Next Step - Managed Lanes as the Natural Evolution in Freeway Management

Expected Outcome(s)

This research would seek to promote managed lanes as the next logical step in the evolution of a freeway. If we assume that we cannot build what is needed, how can we manage the system or the lanes better? How do you help promote a shift in focus and encourage local, regional and state folks to look at managed lanes more during the planning process? Indeed how do you shift the focus of state DOTs to thinking about multi-year, multi-phase projects that evolve over time? This effort would seek to help better link planning and operations.

Research Problem 2D:

**Collaboration with Non-Traditional Partners
and**

Research Problem 2E:

Identification of Institutional Opportunities and Approaches

Expected Outcome(s)

This effort will help improve institutional relationships and collaboration efforts. By looking at the institutional approaches currently used (especially when linked with toll authorities) much can be learned about how to promote collaboration with non-traditional partners such as toll authorities, commercial vehicle operators, and new regional transportation authorities.

Day 1- Topic Area 3
Facility Planning and Design

Problem Statement 3A:

Design Guidance Manuals with Examples for a Range of Managed Lane Scenarios and Conditions
and

Problem Statement 3C:

Applied Engineering and Modeling to Support Managed Lane Project Development and Design

Research Tasks:

1. Identify the state of practice (including the applied engineering and modeling tools) of geometric design approaches pertinent to managed lanes for a range of scenarios and conditions. Review examples of managed lane cross-sections, such as 3/2 versus 4/1, for a range of options. Perhaps fund a demonstration project to collect the physical design information that is desired. Gather more proven examples.
2. Identify design criteria for system expansion/conversion strategies, including operating thresholds and tools that show the full range of options from low end to high end solutions. Develop a set of ‘talking tools’ that facilitate communication of options, benefits, and modal tradeoffs with the public, elected officials, and other stakeholders.

Expected Outcome(s):

- Design guidance - Provision of examples for a range of conditions. Possible a demonstration project.
- Information on threshold systems and tools to go from low-end to high-end managed lane solutions.
- Information on “talking tools” for a menu of options.

Problem Statement 3C:

Multimodal Integration (Bus, HOV, SOV) Issues

Research Tasks:

Gather information on the state of practice of multimodal integration issues for managed lanes, including information on current access (for Bus, SOV, and HOV) and mode transfer points, historical funding policies/ patterns that may support or hinder integration or connectivity, public perception/ education/ communication issues related to multiple modal options in managed lanes, and the benefits of integrated systems to both highway users and transit operators (and FHWA and FTA). Review FTA and FHWA funding approaches (history, current, future) and available flexible funding options for managed lane facilities.

Expected Outcome(s):

Information on communications, system continuity, public perception education tools, and benefits of future systems.

Problem Statement 3D:

System Connectivity Issues for Managed Lanes

Research Tasks:

Determine state of the practice on how managed lane systems connect with other types of systems, such as HOV facilities, toll roads, free roads, or arterial roads.

Expected Outcome(s):

Design guidance - Provision of examples for a range of conditions.

***Day 1- Topic Area 3
Facility Planning and Design***

Problem Statement 3E:

Legal Issues and Relationships Surrounding Managed Lanes

Research Tasks:

Synthesize issues from agency perspectives, looking at existing agreements, as well as legal & functional (non-statutory) agreements allocating risk and responsibility. Preparation of templates that can be used to draft legal and functional agreements between and among participating entities that address fiscal, technical, liability risks and responsibilities.

Expected Outcome(s):

Identification of issues from an agency perspective; identification of legal concerns, risk assessment, and development of sample documents allocating these risk relationships.

Problem Statement 3F:

Freight Issues and Managed Lanes

Research Tasks:

Collect information for existing Managed Lane facilities regarding current user eligibility and specific design features for serving different modes. Develop guidance for incorporating other potential user groups, especially freight haulers, and identify data collection techniques that support decisions regarding time of day usage, vehicle types allowed, and geometric needs identification for various user groups.

Expected Outcome(s):

More detailed information on time-of-day considerations, considerations for specific types of vehicles, and geometric needs for managed lane facilities.

Day 1- Topic Area 4

Day-to-Day Management and Operations of Managed Lane Facilities

Research Problem 4 A:

Automated Occupancy Enforcement

Background

Presently no reliable method of automatically measuring number of occupants in a vehicle for enforcement purposes. This effort would research whether there are systems available or being developed anywhere in the world that would provide automated methods of determining vehicle occupancy. In most cases with HOV lanes, enforcement is simplified because eligibility is fixed during hours of operation. With managed lanes eligibility can vary with demand so occupancy needs automated enforcement to be linked to automatic toll collection.

Research Tasks

1. Review state of practice with systems that can measure vehicle occupancy.
2. Review how such systems would be integrated into managed lanes where either eligibility for lane use or cost to use lane for a given occupancy level varies throughout the day based on lane L.O.S.
3. Estimate likelihood that recommended measuring systems would be accepted by the public and into court evidence for the purpose of automated enforcement.

Expected Outcome(s)

- Recommended systems or areas of development that would lead to systems that could be used for automated enforcement.
- Recommended practices to integrate occupancy measurement systems into an enforcement strategy.

Research Problem 4 B:

Managed Lanes Measures of Effectiveness

Background

In over 30 years of operational experience we have yet to develop good measures of effectiveness that can be used on an ongoing basis for freeway management systems. To get a jump on the issue for managed lanes, measures should be developed that can determine on an ongoing basis if the managed lane is effective.

Research Tasks

1. Review existing Measures of Effectiveness (MOEs) from freeway operations to see if any are applicable for managed lanes.
2. Develop new MOEs as needed for managed lanes

Expected Outcome(s)

- More effective management of managed lanes.
- Information to support studies on operational effectiveness of managed lanes.

Research Problem 4 C:

Operational Strategies Consistent with Sustainable Policy Objectives

Background

Operational strategies are usually short term. For example, a managed lane facility may start as an HOV 2 or HOV 3 facility and there needs to be a policy basis to support changes to eligibility requirements later in the life of the facility. Policy objectives are defined for projects in the beginning, but may not be grounded (such as in law) to make them sustainable as the political environment changes. This research will address what can be done to strengthen the environment so that operational strategies can continue to be consistent with policy objectives over time.

Research Tasks

1. Compile operational strategies.
2. Look at what has lead to a policy objective for a project being sustained over time and through changing political climate. Research policy objectives that have been sustained over time through changing political climates to see what factors led to this success.
3. Identify federal policies/regulations which would lead to policy sustainability.
4. Examples of operational strategy “best practices” that accommodate change while holding to policy objectives.

Expected Outcome(s)

- Improved guidance.
- This research effort would yield projects with a stronger ability to sustain original policy objectives.

Research Problem 4 D:

The Use of Fare Integration in Managed Lanes to Facilitate a Regional Transportation System and Allow for User Flexibility

Background

Current fare collection systems encourage independent decisions by users, and encourage separate non-multimodal commutes. Fare integration systems could allow HOT lanes to interact with park-&-ride facilities and transit systems. Fare integration could improve overall mobility.

Research Tasks

1. Identify what technology would be required to give greatest user flexibility.
2. What policy issues which would need to be considered to determine fare/model inter-relations?

Expected Outcome(s)

- Guidelines/criteria to consider in establishing fees/fares regarding modal transfers.
- Policy issues requiring decisions.
- Identification of integration technology.

Research Problem 4 E:

How Dynamically Can Prices Change?

Background

In San Diego, on the I-15 HOT lane facility prices can change as often as every 6 minutes, by as much as 25 (or 50) cents. For pricing fairness the public may object to the toll changing too rapidly or if they perceive it being arbitrarily set. With what frequency and dollar amount of a toll change would the public be comfortable?

Research Tasks

1. Review and research the public acceptability of dynamic tolling.
2. Investigate the difference in perception of pricing between prices by time-of-day compared to dynamic pricing based on Level of Service. How does the public perceive and react to time-of-day pricing vs. dynamic tolling?
3. Understand how prices are set by authorities. Is it in legislation? Is the operating agency given a range of tolls to work within? How are toll changes made?

Expected Outcome(s)

- Guidance on perceptions and how existing agencies and authorities set tolls.

Day 2 - Category 1

Policy, Planning, and Implementation Processes, as well as Concepts, Rationale and Innovations and Finance Issues

Policy Statement - 1:

Federal Funding for Pricing Implementation, Education, Research and Evaluation

Background

The Federal Pricing Pilot Program (funded since 1991 through ISTEA and TEA-21) has provided critical start-up funding for state and local pricing projects, education, research and evaluation.

Policy Tasks

Maintain federal funding for pricing implementation, education, research and evaluation.

Expected Outcome(s)

Federal funding will lead to more successful projects, better performance data, and increased learning about pricing as a transportation management and financing tool.

Research Problem- 1.A:

Comprehensive Policy Analysis of Next Generation Freeway Lane Strategies; A Comparative Analysis of the Future Role of Pricing, HOV Incentives and Integrated Transit Initiatives

Background

Currently, there are potential conflicts between existing federal and state policies on pricing and HOV regulation which could constrain innovation. Comprehensive solutions (incorporating joint highway and transit coordination and integrated transit, such as Bus Rapid Transit) need to be explored. A "Next Generation" update to the National Academy of Science's "Curbing Gridlock" policy report - 10 years later - is needed to provide a "new generation" vision.

Research Tasks

1. A review of existing policies and laws (at the federal and state level) which would effect HOV, priced and managed lane strategies.
2. A review of existing experiences and lessons learned from various priced and managed lane strategies.
3. Outreach to states and local governments about issues and constraints regarding implementing priced lanes, managed lanes and integrated transit initiatives.
4. A comparative analysis of the effectiveness of alternative strategies and a combination of strategies, in various urban settings.
5. Identification of barriers and constraints to deployment of possible next generation initiatives.

Expected Outcome(s)

- Comparative analytical results of the effectiveness of alternative strategies.
- Identification of consistent policies that enable implementation of optimal next generation strategies.
- A TRB/ National Academy of Sciences Special Report.
- Policy recommendations to DOT from TRB/ National Academy of Sciences.

Research Problem- 1.B:

Integrated Transportation Planning for Combination of Pricing, HOV, Transit, Land Use and Supportive Demand Management Incentives

Background

In order to fully understand the benefits and impacts of priced lanes, priced lanes need to be evaluated in combination with other strategies, not alone, to ensure effectiveness. Evaluation tools are needed to estimate the impacts of combined strategies, and to evaluate these combined strategies against conventional strategies. A simple understandable measure needs to be used for purposed of comparing strategies. In addition, a effort to promote public understanding of the alternatives' benefits and costs is needed. This research activity would cover three main areas, a literature review, model identification and refinement and evaluation tool development.

Research Tasks

1. A literature review (covering state of the art and state of the practice) for evaluation processes of priced

- lanes in combination with other strategies would be undertaken.
2. Identification of models and improvements to such models as sketch planning and detailed 4-step modeling approaches which can be used to evaluate priced lanes and other alternatives. A test of these modeling tools with case studies.
 3. Evaluation - develop evaluation tools such as benefit-cost analysis, and simplified evaluation measures such as cost per person minute of delay reduced or cost per person trip served.

Expected Outcome(s)

- Planning organizations will have needed tools to present impacts and evaluation measures to compare integrated priced lane approaches with conventional approaches.
- Elected officials and the public will have better information to evaluate trade-offs between integrated priced lane strategies and conventional approaches.

Research Problem- 1.C:

Equity Issues: An Assessment of Equity Implications of Pricing Programs, Mitigation Strategies and Comparative Analysis of Equity Vis-à-vis Pricing and Non-Pricing Alternatives

Background

Equity concerns are a major roadblock to the implementation of priced lane strategies. There is a need for documentation, comprehensive assessment, and measurement of equity impacts of pricing strategies (I.e. who benefits and who bears the burden). Equity implications of pricing need to be compared and contrasted with alternative strategies. Mitigation actions need to be identified and packaged with pricing. A public education strategy and tools need to be developed.

Research Tasks

1. Development of a comprehensive list of equity concerns and identification of criterion measures for areas including, but not limited to: income equity; geographical equity; user/non-user equity; and environmental justice.
2. Development of a framework for comprehensive analysis and measurement of equity and environmental justice dimensions.
3. A comparative analysis of the equity justice of priced strategies compared to alternatives, including a base or "null" (do nothing) case scenario.
4. A synthesis of equity experience and lessons from value-pricing programs (implemented and studied)
5. A synthesis of equity and environmental justice experience from other program areas and fields.

Expected Outcome(s)

- A comprehensive analysis framework.
- Identification of analysis/measurement methodologies (models, sketch planning techniques) for addressing equity concerns.
- A comparative scheme presenting equity measure estimates for pricing strategies, alternatives, and "null" (do nothing) case.
- A compilation of mitigation strategies and their costs.
- A handbook of methods and outreach strategies for addressing equity concerns.
- A strategy for peer-to-peer technical/informational assistance regarding equity issues.

Research Problem- 1.D:

Financing Managed Lanes

Background

There is a need to understand the ability for managed lanes to finance themselves and the potential to mix available funding sources as well as attract private sector funding for these types of projects.

Research Tasks

Evaluate:

1. The economics of project development;
2. The financing aspects;
3. The return on investment; and
4. The related impacts.

Expected Outcome(s)

Agencies considering pricing applications will have a sound basis for evaluating financing options and

performance, as well as the ability to attract private sector funding.

Research Problem- 1.E:

Environmental Impacts of Managed Lanes and Priced Lanes

Background

There is a need to increase the understanding of the process and impacts associated with incorporating managed lanes or priced lanes into the existing environmental planning and review process.

Research Tasks

1. Identify the data available to examine the environmental impacts of managed lanes and priced lanes.
2. Identify the data and institutional changes needed to examine the environmental impacts of managed lanes and priced lanes.
3. Impact areas to be considered include, but are not limited to: Air quality; general mobility, and economic impacts.

Expected Outcome(s)

A strategy and process for incorporating managed lane and priced lane projects/ strategies into the transportation planning and environmental planning and review process.

Day 2 - Category 2
Achieving Public Acceptance

Research Problem - 2.A :

Achieving Public Acceptance - Developing and Marketing the Message for Priced Lanes

Background

In order for the public, planners, engineers and politicals to embrace pricing concise information and consensus on what priced lanes is offering needs to be prepared.

Research Tasks

1. To make it easier at the local level to introduce pricing, an effort is needed to identify the laundry list of issues that will come up, including: real issues vs. perceived issues.
2. Focus Groups - can be held to delve into specific issues and marketing techniques and strategies. Include operating, finance, and transit representatives together in their own focus groups.
3. After holding focus groups, identify what does and doesn't work. Use a qualitative approach to identify issues which can be quantified.

Expected Outcome(s)

- Identify real and perceived issues and then marketing folks can develop clear and consistent strategies to address these issues. Emphasis on text and visual materials to get the point across.
- Messages tailored to the needs/interests of various constituencies. Demonstrate how priced lanes can be consistent to the needs and interests of various constituency groups.

Research Problem - 2.B:

Guidebook/Training for Integrating Pricing into the Regional Transportation Planning Process

Background

Pricing strategies are not adequately integrated into the regional planning process. Research is needed to encourage this integration.

Research Tasks

1. Review examples or cases where regional entities are currently integrating pricing strategies into their planning process.
2. Prepare a best practices piece for select cases.
3. Investigate how to improve the interface between engineers and marketing professionals in developing pricing strategies.
4. Research and identify thresholds for introducing pricing components to different modes.

Expected Outcome(s)

- Develop a guidebook with separate recommendations for implementing pricing. The guidebook should address different reasons and objectives for implementing pricing, and develop recommendations for delivering clear and consistent messages about pricing impacts to stakeholders.
- As part of this effort ongoing training courses on integrating pricing strategies into the regional planning process would be conducted.

Day 2 - Category 3

Technical and Operational Issues, Benefits and Ways to Measure the Impacts of Managed and Priced Lanes

Research Problem 3.A:

Process Control Strategies for HOT Lanes (HOV Free, Non-HOV Pays) Including Technology, Methods, Procedures, Etc., to Identify Occupancy

Background

Currently toll roads have good enforcement mechanisms and HOV lanes have good self-enforcement. High Occupancy Toll lanes make it more difficult to regulate eligibility and as such more difficult to enforce.

Research Tasks

1. Determine the range of pricing/tolling strategies to be reviewed.
2. Review enforcement procedures for these types of strategies and look for gaps in effective enforcement.
3. Review the current technology and methods to proposed how to fill existing gaps in effective enforcement.

Expected Outcome(s)

- Identification of systems and methods that effectively enforce HOT lanes.
- Preparation of guidelines and best practices for effectively enforcing HOT lane facilities.
- Identification of functional standards and specifications for technology to enforce HOT lane facilities.

Research Problem - 3.B:

Develop and Update Technical Guidance in a Pricing Handbook

Background

A lessons learned document covering current and future experiences regarding priced lanes is needed. Such a document would be able to capture and disseminate information on best practices and emerging technology. A Pricing Handbook could better legitimize the subject and profession as well as creating a comprehensive toolbox for practitioners, and improving consistency in current practice.

Research Tasks

1. Collect and synthesize current guidance (e.g., HOT Lane Manual, Pricing Proceedings, case studies lessons learned).
2. Collect, summarize and analyze current performance, planning and design practice for priced lane strategies.
3. Develop and update guidance on a subject-specific and/or issue-specific basis for various priced lane strategies.
4. Publish and disseminate guidance document.

Expected Outcome(s)

- A reference document for practitioners.
- Synthesis of improved tools, techniques, and practices.
- Development of materials to promote better professional and stakeholder understanding of priced lane concepts.
- Ultimately, more projects successfully deployed and mainstreaming of priced lane practice into implementation.

Research Problem 3.C:

Driver Information and Signage for Priced Lanes

Background

Currently no guidance exists for providing driver information on priced or managed lanes. Although the issue is not extremely difficult for lanes with a single entrance and exit point, it gets very complicated for multi-point systems (with multiple points of ingress and/or egress) now being built. For example, how

much variation in pricing (i.e., how many entrance points) can be signed with a single sign?

Research Tasks

1. Review and determine common operating scenarios (i.e., price variation by segment, pricing based on entry point alone, pricing based on distance traveled, etc.) to be addressed by this research effort.
2. Develop signing/information scenarios to guidance for each operating scenario identified above.
3. Determine where signing/information is required (i.e., on mainline before entrances, on managed lanes before intermediate exits, on arterials).
4. Check signing scenarios with human factors expert.

Expected Outcome(s)

- Standardized application across priced and managed lane implementations which will result in higher safety and compliance.
- Effective solutions and guidance for difficult signing problems like multi-entrance/exit systems.
- Development of a MUTCD (Manual on Uniform Traffic Control Devices) section on this topic.